SIEMENS

Room Thermostat with Display, for VAV

RDG400

Basic Documentation

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Building Technologies

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1 About this document

1.1 Revision history

Edition	Date	Changes	Section	Pages
1.0	May 2009	First edition		

1.2 Reference documents

Ref.	Document title	Type of document	Document No.
[1]	Wall-mounted room thermostat with LCD	Data sheet	CE1N3182en
[2]	RDG400	Operating Instructions	CE1B3182en
[3]	RDG400	Mounting Instructions	CE1M3182en

1.3 Before you start

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2 Summary

2.1 Brief description

Applications

- Single-duct system
- Single-duct system with electrical heater
- Single-duct system and radiator / floor heating
- Single-duct system with heating / cooling coil

Features

- Two multifunctional inputs and one digital input for keycard contact, external sensor, etc.
- Operating modes: Comfort, Energy Saving and Protection
- Automatic or manual heating/cooling changeover
- Adjustable commissioning and control parameters
- Minimum and maximum setpoint limitation
- Backlit LCD

- AC 24 V operating voltage
- Modulating PI / P control
- Output DC 0 … 10 V
- Output signal inversion as an option
- Output on/off, PWM or 3-position control
- Adjustable minimum and maximum limitation of air flow output signal

- Maintain room temperature via built-in temperature sensor or external room temperature / return air temperature sensor
- Automatic or manual changeover between heating and cooling mode
- Select applications via DIP switches
- Select operating mode via the operating mode button on the thermostat
- Display current room temperature or setpoint in °C and/or °F
- Minimum and maximum setpoint limitation
- Button lock (automatic and manual)
- One digital input, freely selectable for:
  - Operating mode switchover contact (key card)
  - Automatic heating/cooling changeover contact
  - Electrical heater enable
  - Fault input
- Two multifunctional inputs, freely selectable for:
  - Operating mode switchover contact (key card)
  - Automatic heating/cooling changeover sensor
  - External room temperature or return air temperature
  - Dewpoint sensor
  - Electrical heater enable
  - Fault input
- Floor heating temperature limit
- Reload factory settings for commissioning and control parameters

2.2 Types and features

Product no.	Operating voltage	Number of control outputs				LCD backlight
		ON/OFF	PWM	3-pos	DC 0 … 10 V	
RDG400	AC 24 V	**1** [1)]	**1** [1)]	**1** [1)]	**1**	✓

1) Either ON/OFF, 3-position or PWM (triac outputs)

2.3 Equipment combinations

	Description		Product no.	Data Sheet
	Cable temperature sensor		**QAH11.1**	1840
	Room temperature sensor		**QAA32**	1747
	Condensation detector / extension module		**QXA2000 / AQX2000**	1542
DC 0..10 V actuator	Electrical actuator, DC 0..10 V (for radiator valve)		**SSA61...**	4893
	Electrical actuator, DC 0..10 V (for 2 and 3 port valves / V…P45)		**SSC61…**	4895
	Electrical actuator, DC 0..10 V (for small valve 2,5 mm)		**SSP61…**	4864
	Electrical actuator, DC 0..10 V (for small valves 5.5 mm)		**SSB61...**	4891
	Electrical actuator, DC 0..10 V (for Combi-valve VPI45)		**SSD61...**	4861
	Thermal actuator, DC 0..10 V (for small valves and radiator valves)		**STS61**	4880
	DC 0…10 V damper actuator		**GQD161…**	4605
			GDB161…	4634
			GLB161…	
			GMA161…	4614
			GEB161…	4621
			GCA161…	4613
			GBB161…	4626
			GIB161…	
	VAV compact controller		**GDB181.1E/3**	3544
			GLB181.1E/3	
ON/OFF actuators AC 24 V	Electromotoric ON/OFF valve and actuator (only available in AP, UAE, SA and IN)		**MVI…/MXI…**	4867
	Electromotoric ON/OFF actuator		**SFA71...**	4863
	Thermal actuator (for radiator valve)		**STA71...**	4877
	Thermal actuator (for small valves 2.5 mm)		**STP71...**	4878

3-position actuators
AC 24 V

Electrical actuator, 3-position (for radiator valve)		**SSA81...**	4893
Electrical actuator, 3-position (for small valve 2,5 mm)		**SSP81…**	4864
Electrical actuator, 3-position (for small valve 5,5 mm)		**SSB81...**	4891
Electrical actuator, 3-position (for Combi-valve VPI45)		**SSD81...**	4861
Electromotoric actuator, 3-position (for valves 5.5 mm)		**SQS85…**	4573

2.4 Accessories

Description	Product no.	Data Sheet
Changeover mounting kit (50 pcs / package)	ARG86.3	1840
Adapter plate 120 x 120 mm for 4“ x 4“ conduit boxes	ARG70	
Adapter plate 112 x 130 mm for surface wiring	ARG70.2	

2.5 Ordering

When ordering, please indicate product no. and description:
E.g. **RDG400 room thermostat**

Order valve actuators separately.

3 Use

The room thermostat is designed for the following types of system:

VAV systems via ON/OFF or modulating control outputs:

- Single-duct system
- Single-duct system with electrical heater
- Single-duct system and radiator / floor heating
- Single-duct system with heating / cooling coil

4 Functions

4.1 Temperature control

General note

Setting of the control parameters (P01 etc., mentioned throughout the document) is described in section 4.12.

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1), and maintains the setpoint by issuing actuator control commands to heating and/or cooling equipment. The following control outputs are available:

- Modulating PI / P control with DC 0 … 10 V control output
- Modulating PI / P control with 3-position control output
- Modulating PI / P control with PWM output
- On/off control (2-position)

The switching differential or proportional band is 2 K for heating and 1 K for cooling (adjustable via parameters P30 and P31).
The integral action time for continuous PI control is 5 minutes (adjustable via parameter P35).

Display

The display shows the acquired room temperature or the Comfort setpoint, selectable via parameter P06. The factory setting displays the current room temperature. Use parameter P04 to display the room temperature or setpoint in °F rather than °C as needed.

/

If the thermostat is used in a system with manual heating/cooling changeover (P01=2), the heating and cooling symbols on the display show the terminal unit status. Thus, the symbols are displayed even when the thermostat operates in the neutral zone. For all other cases, the heating and cooling symbols are displayed when the heating or cooling output is energized.

Concurrent display of °C and °F

Concurrent display of the current temperature or setpoint in °C and in °F (parameter P07) is possible.

4.2 Operating modes

Select the thermostat's operating mode via operating mode button on the thermostat or operating mode input (e.g. keycard occupancy sensor, when X1, X2, or D1 set to 3 (P38, P40, P42). A corresponding setpoint is used to maintain the room temperature at the desired level depending on the active operating mode. The following operating modes are available:

Comfort mode ☼

In Comfort mode, the thermostat maintains the setpoint which can be adjusted via the **rotary knob**. The fan can be set to automatic or manual fan speed: Low, medium or high.

Energy Saving ☾

Energy Saving mode helps save energy. Select it by pressing the operating mode button if parameter P02 is set accordingly, or if the external operating mode switchover contact is active (e.g. window contact).

Note

If the external operating mode switchover contact is active, user operations are ineffective and “OFF” is displayed. Control will then be according to Energy Saving setpoints (P11 and P12).

Protection mode ⌂

In Protection mode, the system is
- protected against frost (factory setting **8°C**, can be disabled or changed via P65)
- protected against overheating (factory setting **OFF**, can be enabled or changed via P66)

Operating mode button

The behavior of the operating mode button can be selected via parameter P02:

#	Sequence	Remark
1	⌂ → ☼	Factory setting
2	⌂ → ☼ → ☾	

4.3 Setpoints

Comfort mode ☼

The setpoint in Comfort mode can be adjusted via the **rotary knob**.

Setpoint limitation

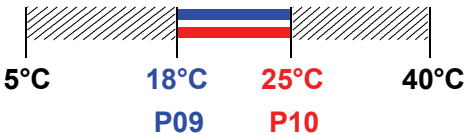
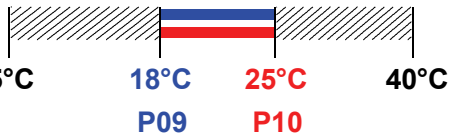
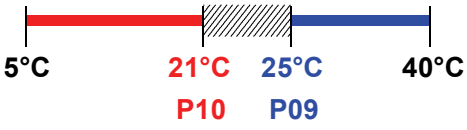
For Energy Saving purposes, the setpoint adjusting range can be limited to minimum (P09) and maximum (P10).

P09 < P10

- If the minimum limit **P09 is set lower** than the maximum limit P10, both heating and cooling are adjustable between these two limits.

P09 ≥ P10

- For heating **or** cooling applications (e.g. single duct; single duct & H/C coil)
  – The setting range in cooling mode is from **P09…40°** instead of 5…40°
  – The setting range in heating mode is from **5…P10°** instead of 5…40°
- For cooling **and** heating with electrical heater or radiator applications
  – **P09** is the setpoint for cooling and **P10** the setpoint for heating;
  – the setpoint can no longer be adjusted via rotary knob

Examples	Single duct heating or cooling	Single duct cooling with el. heater / radiator
P09 < P10	 Cooling setpoint adjustable 18…25°C Heating setpoint adjustable 18…25°C	 Cooling setpoint adjustable 18…25°C Heating setpoint adjustable 18…25°C
P09 ≥ P10	 Cooling setpoint adjustable 25…40°C Heating setpoint adjustable 5…21°C	Cooling fixed = 25°C (P09) Heating fixed = 21°C (P10)

Temporary setpoint

If the “Temporary setpoint function” is enabled via parameter P69, the setpoint adjusted via rotary knob is set back to the Comfort basic setpoint when the operating mode changes.

The factory setting for the Comfort basic setpoint is **21 °C** and can be changed via parameter P08.

Energy Saving mode ☾

Use control parameters P11 and P12 to adjust the Energy Saving mode setpoints. The heating setpoint is factory-set to **15 °C** and to **30 °C** for cooling.

Protection mode

Use control parameters P65 and P66 to adjust the Protection mode setpoints. The heating setpoint is factory-set to **8 °C** (frost protection) and to **OFF** for cooling.

Caution ⚠

If a setpoint is set to OFF (P65, P66), the thermostat does not maintain the setpoint in the corresponding mode (heating or cooling).
This means no protective heating or cooling function and thus risk of frost in the heating mode or risk of overheat in cooling mode!

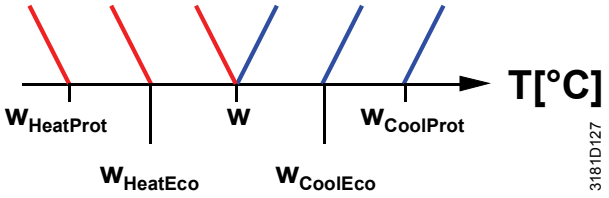
4.4 Setpoints and sequence

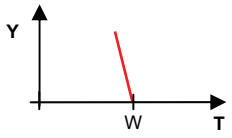
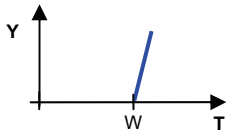
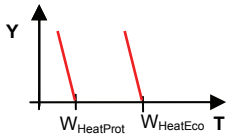
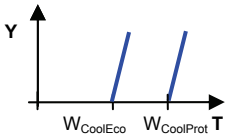
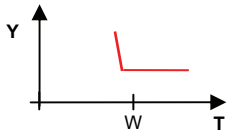
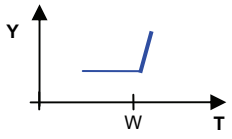
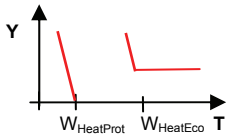
In single-duct changeover applications the Comfort setpoints for heating and cooling sequence are the same (w).

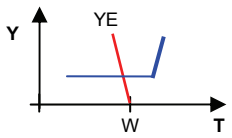
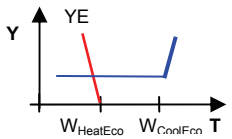
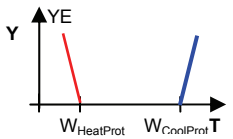
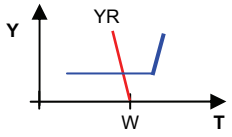
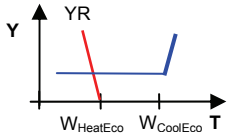
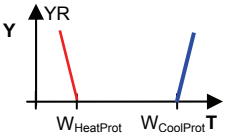
In applications with electrical heater, radiator or heating / cooling coil the Comfort setpoint is at the heating sequence.
The start of the cooling sequence is linked to “Dead-zone” above the Comfort setpoint. The dead zone can be set via parameter P33.

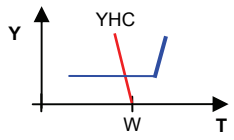
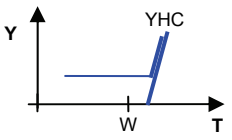
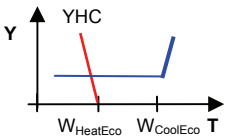
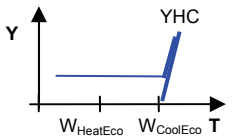
The setpoints for Energy Saving and Protection mode are below the Comfort setpoints (heating) and above the Comfort setpoints (cooling).
They can be set via parameters P11, P12 (Energy Saving) and P65, P66 (Protection).

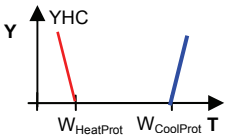
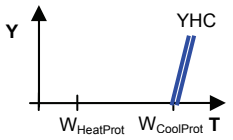
The control signal for air flow can be limited via parameters P63 and P64.
See section 4.8.1.
To simplify the diagram below, only minimum limitation is shown.



Application	Comfort mode		Energy Saving / Protection mode	
	Heating mode	Cooling mode	Heating mode	Cooling mode
Single duct				
Single duct with min/max limitation				

Application	Comfort mode	Energy Saving	Protection mode
Single duct with electrical heater			
Single duct with radiator			

Application	Comfort mode		Energy Saving mode	
	Heating mode	Cooling mode	Heating mode	Cooling mode
Single duct with heating / cooling coil				

Protection mode	
Heating mode	Cooling mode
	

W=Setpoint in Comfort mode

$W_{HeatEco/Prot}$ = Setpoint heating in Energy Saving or Protection mode

$W_{CoolEco/Prot}$ = Setpoint cooling in Energy Saving or Protection mode

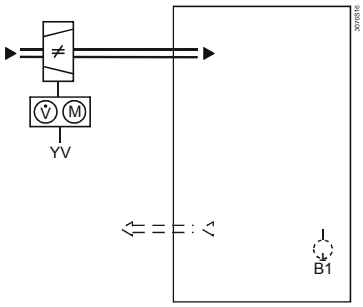
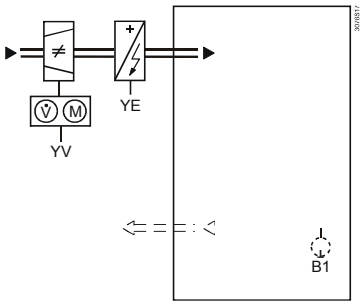
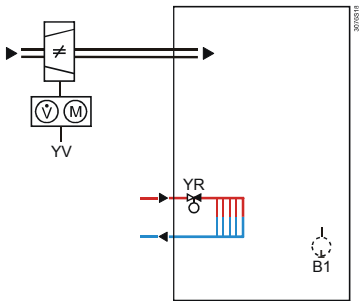
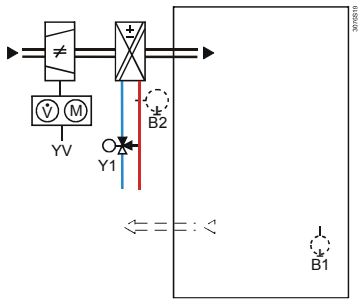
YR = Radiator sequence

YE = El. heater sequence

YHC = Heat/cool coil sequence

4.5 Applications overview

The thermostat supports the following applications, which can be **configured via DIP switches** at the rear of the unit. The control output for the **damper** actuator is either DC 0…10 V (factory setting) or 3-position (see parameter P47), and for the **heating / cooling output** ON/OFF, PWM, 3-position or DC 0…10 V.

Application		DIP switch	Control output
Single-duct • DC 0…10 V damper actuator • 3-position damper actuator			DC 0…10 V 3-position
Single-duct with electrical heater • DC 0…10 V damper actuator and ON/OFF, PWM or 3-position electrical heater • 3-position damper actuator and DC 0…10 V electrical heater			DC 0…10 V ON/OFF, PWM or 3-position
Single-duct and radiator / floor heating • DC 0…10 V damper actuator and ON/OFF, PWM or 3-position radiator • 3-position damper actuator and DC 0…10 V radiator			DC 0…10 V ON/OFF, PWM or 3-position
Single-duct heating / cooling coil • DC 0…10 V damper actuator and ON/OFF, PWM or 3-position heating / cooling • 3-position damper actuator and DC 0…10 V heating /cooling			DC 0…10 V ON/OFF, PWM or 3-position

Key

Y1 Heating or heating/cooling valve actuator
YV damper actuator
YE Electrical heater
B1 Return air temperature sensor or external room temperature sensor (optional)
B2 Changeover sensor (optional)

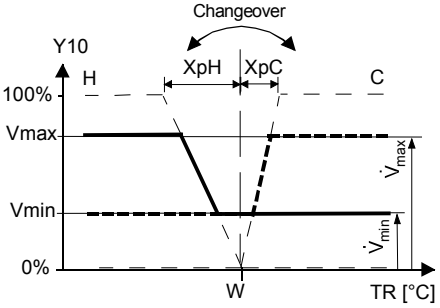
4.6 Additional features

Output signal inversion

The output signals DC 0…10V can be inverted by means of DIP switch 4 (see section 4.7.3).

Min / Max air flow

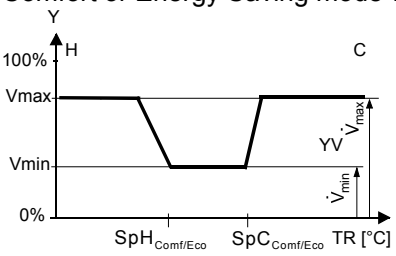
To ensure a minimum or maximum supply air volume, the output signal for the air flow (DC 0...10V or 3-position) can be limited to a minimum value via parameter P63 and to a maximum value via parameter P64.
Both values can be set between 0% and 100%.



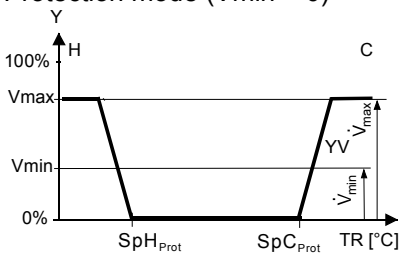
T	Room temperature
Y10	Control output
w	Room temperature setpoint
XpH	Proportional band Heating
XpC	Proportional band Cooling
Vmin	Minimum limitation air flow
Vmax	Maximum limitation air flow

If Vmin is not set >0, then a minimum air flow of Vmin is assured in Comfort and Energy Saving modes. In Protected mode, Vmin is 0.

Comfort or Energy Saving mode with Vmin

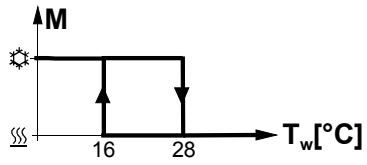


Protection mode (Vmin = 0)



Automatic H/C changeover

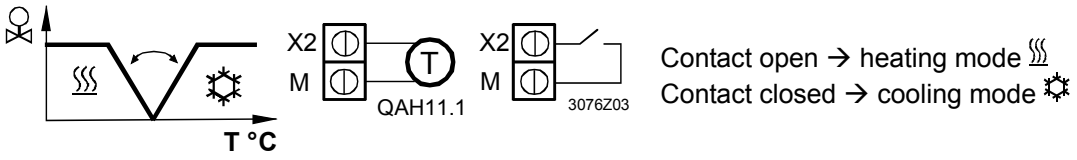
The water temperature acquired by the changeover sensor (QAH11.1 + ARG86.3) is used to change over from heating to cooling mode and vice-versa. When the water temperature is above 28 °C (parameter P37), the thermostat changes over to heating mode, and to cooling mode when below 16 °C (parameter P36).
If the water temperature is between the 2 changeover points immediately after power-up, the thermostat starts in heating mode.
The water temperature is acquired at 30-second intervals and the operating state is updated accordingly.



M	Operating mode		Cooling mode
T_w	Water temperature		Heating mode

Remote heating/ cooling changeover

The QAH11.1 cable temperature sensor for automatic heating/cooling changeover can be replaced by an external switch for manual, remote changeover:



Contact open → heating mode
Contact closed → cooling mode

The sensor or switch can be connected to the input terminal X2 (factory setting) or X1 or D1 (switch only), depending on the commissioning of the inputs (P38, P40, P42).
See also section 4.9 “Multifunctional input”.

External / return air temperature sensor

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1) connected to multifunctional input X1 or X2.
Inputs X1 or X2 need to be commissioned accordingly. See section 4.9 “Multi-functional input”.

Floor heating

Application "Single duct and radiator" can also be used for floor heating.

Floor heating limitation function

The temperature should be limited for two reasons: comfort and protection of the floor. It is only available with application "Single duct and radiator".

The floor temperature sensor, connected to multifunctional input X1 or X2, measures the floor temperature. If the temperature exceeds the parameterized limit (parameter P51), the heating valve is fully closed until the floor temperature drops to 2K below the parameterized limit.
This function is factory-set to OFF (disabled).
Input X1 or X2 must be commissioned accordingly (P38 or P40 = 1).
See section 4.9 “Multifunctional input”.

Recommended values for P51:

Living rooms:
up to 26 °C for long term presence, up to 28 °C for short time presence
Bath rooms:
up to 28 °C for long term presence, up to 30 °C for short time presence

The table below shows the relation between parameter, temperature source and temperature display:

Parameter P51	External temp. sensor available	Source for display of room temperature	Output control according to	Floor temp. limit function
OFF	No	Built-in sensor	Built-in sensor	Not active
OFF	Yes	External temp. sensor	External temp. sensor	Not active
10...50˚C	No	Built-in sensor	Built-in sensor	Not active
10…50˚C	Yes	Built-in sensor	Built-in sensor + limit by external sensor	Active

Dewpoint monitoring

Dewpoint monitoring is essential to prevent condensation on the cooling coil.
It helps avoid associated damage to the building.
A dewpoint sensor with a potential-free contact is connected to multifunctional input X1, X2 or D1. If there is condensation, the cooling valve is fully closed until no more condensation is detected, and the cooling output is disabled temporarily.
The condensation symbol is displayed during temporary override.
The input must be commissioned accordingly (P38, P40, P42).
See section 4.9 “Multifunctional input”.

Button lock

If the button lock function is enabled by parameter P14, then the buttons will be locked or unlocked by pressing the right button for 3 sec.
If “Auto lock” is configured, then the thermostat will automatically lock the buttons 10 sec after the last adjustment.

Operating mode switchover contact (Window contact)

The thermostat can be forced into Energy Saving mode, e.g. when a window is opened. The window contact can be connected to digital input D1 (or multifunctional input X1, X2). Set parameter P42 (P38, P40) to 3.

Extended Comfort mode *(operating mode switchover contact closed)*

The left button switches the operating mode from Energy Saving to Comfort for the period preset in P68, if the following conditions are fulfilled:

- The operating mode switchover contact is closed (connected to input X1, X2, D1, parameter P38, P40, P42 set to 3)
- Parameter P68 (extend Comfort period) is greater than 0

During the temporary Comfort mode extension, timer symbol appears.

If parameter P68 (extend Comfort period) = 0, extended Comfort cannot be activated; pressing the left button will show “OFF” (blinking 3 times)

Temporary timer for extension of presence / absence

The current operating mode can be forced temporarily into Comfort or Energy Saving / Protection mode. The time period is adjusted via the rotary knob:

- Extend presence: Set the device to Comfort mode for the selected time period
- Extend absence: Set the device to Energy Saving / Protection mode for the selected time period

To activate the function, keep the left button pressed and, within 3 seconds, turn the rotary knob

- clockwise for extended presence
- counterclockwise for extended absence

The rotary knob adjusts the time period:

- Extend presence: 0.00…+9:30 in steps of 30 minutes; symbol appears
- Extend absence: 0.00…–9:30 in steps of 30 minutes; symbol or appears

During the extended presence / absence period, timer symbol appears.

Function

User operating mode selection	Operating mode when activating function	Function	Operating mode during function	Operating mode at the end of function
→	Comf	Extension	Comf	Prot
→ → →	Comf	Absence	Prot	Comf
	Prot	Not available	-	-
→ →	Comf	Extension	Comf	Eco
	Comf	Absence	Eco	Comf
	Eco	Extension	Comf	Eco
	Eco	Absence	Eco	Comf
	Prot	Not available	-	-

4.7 Control sequences

4.7.1 Applications and sequences

Application VAV	*Sequences*
Single duct	h (\ ), c (/)
Single duct & electrical heater	el.h + c (⩘ /)
Single duct & radiator	rad + c (r\ /),
Single duct with heat/cool coil	h + c (\ /)

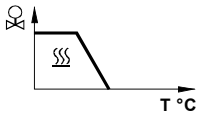
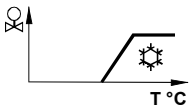
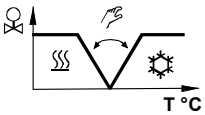
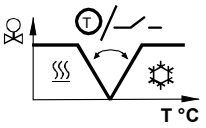
4.7.2 Sequences overview (setting via parameter P01)

The sequence can be set via **parameter P01**, if available.

The thermostats can be used in systems featuring:

- Heating only mode (P01=0)
- Cooling only mode (P01=1)
- Manual heating/cooling changeover (P01=2)
- Automatic heating/cooling changeover (P01=3)
- Heating and cooling mode (e.g. 4-pipe system) (P01=4)

The available modes depend on the application (selected via DIP switch, see section 4.5).

Parameter	**P01 = 0**	**P01 = 1**	**P01 = 2**	**P01 = 3**
Sequence				
Mode	Heating mode	Cooling mode	Manually select heating or cooling mode	Automatic heating/cooling changeover via external water temperature sensor or remote switch
Available for: ⬇				
Single duct	✓	✓	✓ 1)	✓ 1)
Single duct & electrical heater	3)	3)	3)	3)
Single duct & radiator	3)	3)	3)	3)
Single duct with heat/cool coil	✓	✓	✓ 2)	✓ 2)

Notes
1) Changeover air
2) Changeover water; heat/cool coil
3) The controller operates in heating AND cooling mode. P01 is not available

4.7.3 Control outputs overview (setting via DIP 4 / 5 and parameters P46 / P47)

Application ↓ \ Control outputs	ON/OFF (2-position)	Modulating PWM (2-position)	Modulating 3-position	Modulating DC 0 … 10 V
Single duct	✓	✓	✓	✓
Single duct and electrical heater	✓	✓	✓	✓
Single duct and radiator / floor heating	✓	✓	✓	✓
Single-duct heating / cooling coil	✓	✓	✓	✓

The function of the control outputs is set via DIP switches 4 and 5:

DIP 4:	Y10 =	0 … 10 V	0 … 10 V	10 … 0 V inverted	10 … 0 V inv
DIP 5:	Y1 / Y2 =	2-position	3-position	2-position	3-position

Note **Y1, Y2:**

If 2-position is selected, the factory setting is on/off.
If you want PWM (pulse width modulation), set parameter P46 to 2 = PWM.

P47:

- 0 = VAV box DC 0 … 10 V control signal
- 1 = VAV box : 3-position control signal

For details concerning connection of peripheral devices and setting of the DIP switches please refer to the mounting instructions, M3182 [3]:

4.7.4 Single duct

Single duct, heating or cooling

In single duct applications, the controller controls an actuator (valve, damper, VAV system, etc)

– in heating/cooling mode with changeover (automatic or manual),
– heating only mode,
– or cooling only mode.

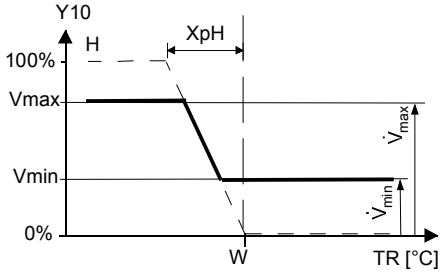
Cooling only is factory set (P01=1).

The output signal for the air flow can be limited to a minimum and maximum value if required (see section 4.6 "additional features").

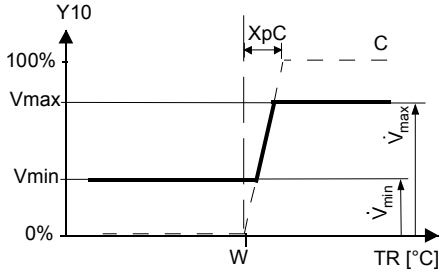
Modulating control 3-position, PWM or DC 0 … 10 V

The diagram below shows the control sequence for continuous PI control.

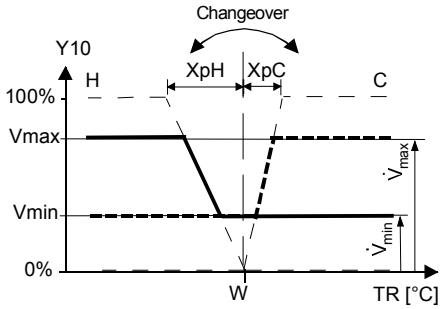
Heating only (P01 = 0)



Cooling only (P01 = 1)



Changeover (P01 = 2, 3)



T[°C]	Room temperature
w	Room temperature setpoint
Y10	Control command “Valve”

XpH	Proportional band “Heating”
XpC	Proportional band “Cooling”
Vmin	Min. limitation for output
Vmax	Max. limitation for output

Note The diagrams show the PI controller’s proportional part only.

Setting the sequence and the control outputs

Refer to sections 4.5 (applications), 4.7.1 (sequences) and 4.7.3 (outputs).

4.7.5 Single duct with electrical heater

Single duct with electrical heater

In single duct applications with electrical heater, the thermostat controls a valve plus an auxiliary electrical heater. Parameter P01 is not available.

The output signal for the air flow can be limited to a minimum and maximum value if required (see section 4.6 "additional features").

Electrical heating, active in cooling mode

The air flow starts to rise when the acquired room temperature is above "setpoint" + "dead zone".
The electrical heater receives an **ON** command when the acquired room temperature drops below “setpoint” – “dead zone” (= “setpoint for electrical heater”).

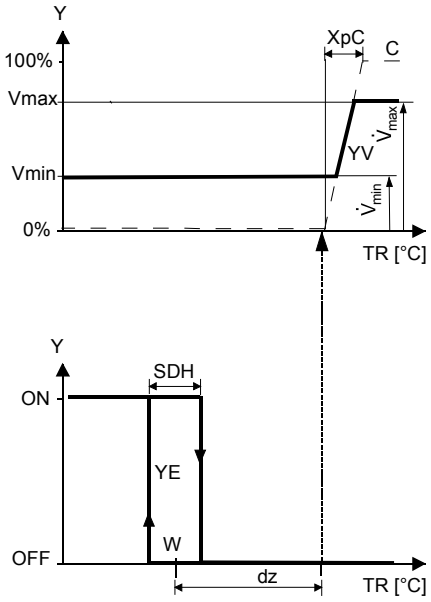
Digital input “Enable electrical heater”

Remote enabling/disabling of the electrical heater is possible via input X1, X2, or D1 for overheat protection, tariff regulations, energy saving etc.
Input X1, X2, or D1 must be commissioned accordingly (parameter P38, P40, P42).
See section 4.9 “Multifunctional input”.

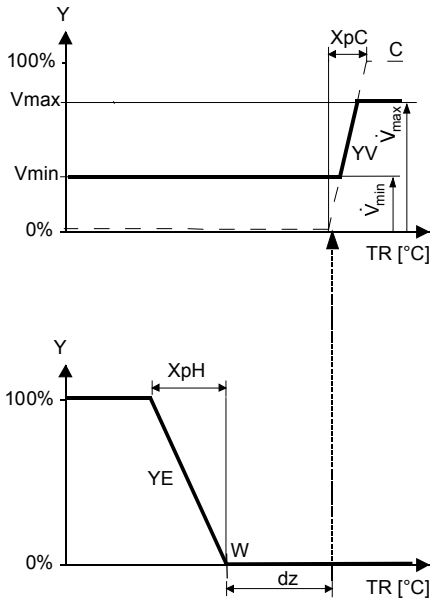
Caution ⚠ In case of insufficient air flow, the thermostat cannot protect the electrical heater against overtemperature. That is why the electrical heater must feature a separate safety device (thermal cutout).

Sequences

ON/OFF electrical heater



Modulating electrical heater



Y	Output signal
TR	Room temperature
W	Effective setpoint Comfort
H	Heating sequence
C	Cooling sequence
YV	Volume flow rate
YE	Electrical heater

XpH	Proportional band heating
XpC	Proportional band cooling
Vmin	Minimum volume output
Vmax	Maximum volume output

Note: The diagrams show the PI controller's proportional part only.

Setting the sequence and the control outputs

Refer to sections 4.5 (applications), 4.7.1 (sequences) and 4.7.3 (outputs).

4.7.6 Single duct with radiator or floor heating

In single duct applications with radiator or floor heating, the thermostat controls a valve plus an auxiliary electrical heater. Parameter P01 is not available.

The output signal for the air flow can be limited to a minimum and maximum value if required (see section 4.6 "additional features").

The air flow starts to rise when the acquired room temperature is above "setpoint" + "dead zone".
The radiator receives an **ON** command when the acquired room temperature drops below “setpoint” – “dead zone” (= “setpoint for radiator”).

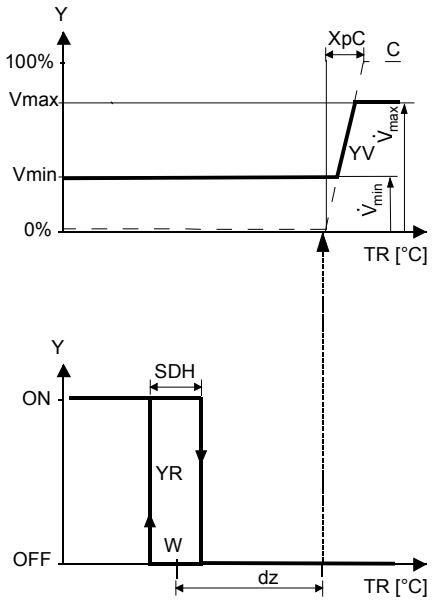
Note: “Setpoint for radiator” is limited by parameter “Maximum heating setpoint” (P10).

Floor heating

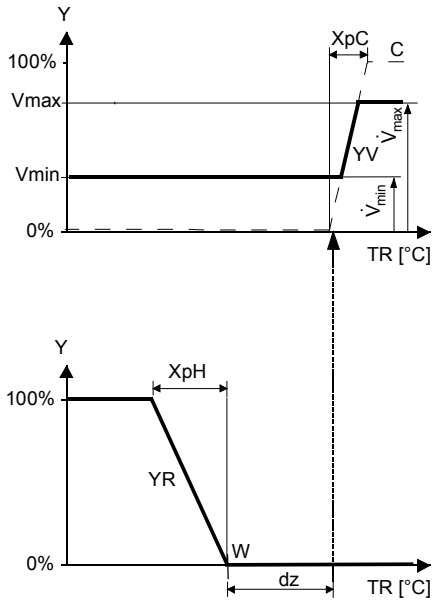
The radiator sequence can also be used for floor heating.
The "Floor heating limitation function" is described on page 15.

Sequences

ON/OFF radiator / floor heating



Modulating radiator / floor heating



Y	Output signal
TR	Room temperature
W	Effective setpoint Comfort
H	Heating sequence
C	Cooling sequence
YV	Volume flow rate
YR	Radiator / floor heating

XpH	Proportional band heating
XpC	Proportional band cooling
Vmin	Minimum volume output
Vmax	Maximum volume output

Note: The diagrams show the PI controller's proportional part only.

Setting the sequence and the control outputs

Refer to sections 4.5 (applications), 4.7.1 (sequences) and 4.7.3 (outputs).

4.7.7 Single duct with heating / cooling coil

In single duct applications with heating / cooling coil, the controller controls an actuator (damper, VAV system, etc.) plus a reheating / cooling water coil.

The output signal for the air flow can be limited to a minimum and maximum value if required (see section 4.6 "additional features").

The thermostat controls the reheating / cooling water valve either in heating / cooling mode with changeover (automatic or manual), heating only, or cooling only. Cooling only is factory set (P01=01).

Water coil valve in cooling mode

If the room temperature is above the setpoint for cooling, the valve will receive an **OPEN** command and the air flow signal starts to rise in order to maintain the room temperature.

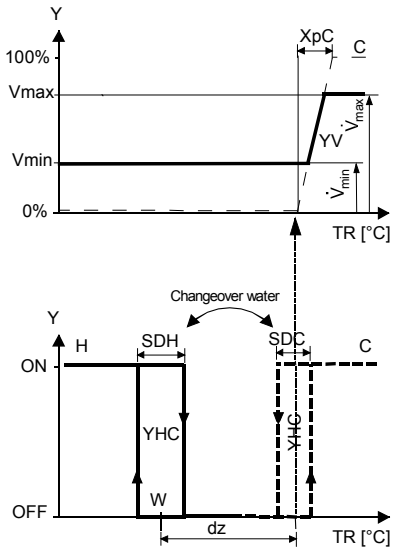
Water coil valve in heating mode

If the room temperature drops below the setpoint for heating, then the valve will receive an **OPEN** command.

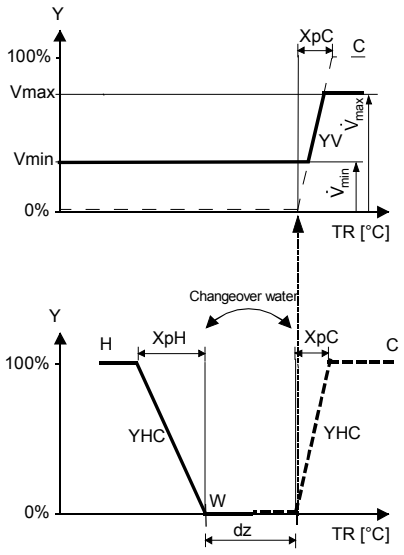
Control sequence

The diagram below shows the control sequence for continuous PI control in Comfort mode.

On/off heating / cooling coil



Modulating heating / cooling coil



Y	Output signal
TR	Room temperature
W	Comfort setpoint
H	Heating sequence
C	Cooling sequence
YV	Volume flow rate

XpH	Proportional band heating
XpC	Proportional band cooling
Vmin	Minimum volume output
Vmax	Maximum volume output

Note: The diagrams show the PI controller's proportional part only.

Setting the sequence and the control outputs

Refer to sections 4.5 (applications), 4.7.1 (sequences) and 4.7.3 (outputs).

4.8 Control outputs

Overview of control outputs

Different control output signals are available depending on the configuration of thermostat via DIP switches 4 & 5, and parameters P46 & P47.

Control output / Product No.	Modulating DC 0 … 10 V	2-position on/off	2-position PWM	Modulating 3-position
RDG400	Y10	Y1	Y1	Y1/Y2 (1 x ▲ / ▼)

4.8.1 Control output for air flow

DC 0..10 V control signal

The demand calculated by the PI control from the current room temperature and setpoint is provided to the valve actuator as a continuous DC 0...10 V signal via output Y10.

3-posotion control signal

A 3-position control output for a damper has 2 control signals, one for the “opening” command and one for the “closing” command. The thermostat has an internal stroke model to calculate the position of the actuator. Therefore the running time from the fully closed to the fully open position has to be adjusted via parameter P44 (from 20…300sec; factory setting is 150 seconds).

Synchronization

In single-duct applications, a closing synchronization is done to readjust the internal stroke model to the real position of the actuator.

1. When the controller starts up, a closing signal (actuator running time + 150% = 2.5 x running time) is delivered to ensure the actuator will be fully closed and synchronized with the control algorithm.
2. Each time the controller calculates the position fully **closed**, the actuator’s running time is extended + 150% to ensure the right position of the actuator.
3. When the actuator has reached the position calculated by the controller, a waiting time of 30 seconds is observed in order to stabilize the outputs.

Note: *opening* synchronization is available for valve outputs only.

4.8.2 Control output for electrical heater, radiator and heating / cooling coil

ON/OFF control signal
(2-position)

The valve receives an **OPEN/ON** command via control output Y1

1. When the acquired room temperature is below “setpoint” (heating mode) or above the setpoint (cooling mode)
2. When the control outputs have been inactive for more than the “Minimum output off-time” (factory setting 1 minute, adjustable via parameter P48).

OFF command for valve output:

1. When the acquired room temperature is above the setpoint (heating mode) or below the setpoint (cooling mode).
2. When the valve has been active for more than the “Minimum output on-time” (factory setting 1 minute, adjustable via parameter P49).

Electrical heater control signal
(2-position)

The electrical heater receives an **ON** command via the auxiliary heating control output (Y1):

1. When the acquired room temperature is below “setpoint for electric heater”.
2. When the electrical heater has been switched off for at least 1 minute.

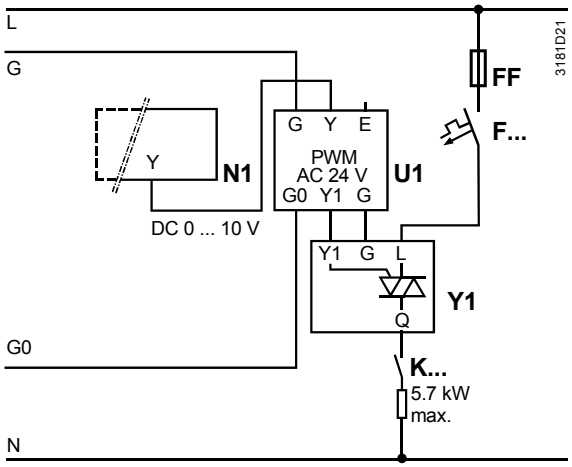
The **OFF** command for the electrical heater is output:

1. When the acquired room temperature is above the setpoint (electric heater).
2. When the electrical heater has been switched on for at least 1 minute.

Caution ⚠ A safety thermostat (to prevent overheating) must be provided externally.

DC 0 ... 10 V for el. heaters

- The demand calculated by PI control from the current room temperature and setpoint is provided via Y10 as a continuous DC 0 ... 10 V signal.
- The signal converter (SEM61.4) converts the DC 0 ... 10 V signal to AC 24 V PDM pulses for the current valve
- The current valve (SEA45.1) supplies the el. heater with AC 50 … 660 V pulsed current.



N1 RDG400
U1 Signal converter SEM61.4 (see data sheet N5102)
Y1 Current valve SEA45.1 (see data sheet N4937)
K… Safety "chain", e.g. safety thermostat and high-temperature cut-out
FF Very fast-acting fuse
F… Overcurrent trip

3-position control signal

Output Y1 provides the **OPEN** command, and Y2 the **CLOSE** command to the 3-position actuator.
The factory setting for the actuator runtime is 150 seconds. It can be adjusted via parameter P44 (Y1 and Y2).
The parameter is only visible if 3-point is selected via DIP switch 5.

Synchronization

1. When the thermostat gets powered up, a closing command for the actuator runtime + 150 % is provided to ensure that the actuator fully closes and synchronizes to the control algorithm.
2. When the thermostat calculates the positions "fully close" or "fully open", the actuator runtime is extended + 150 % to ensure the right actuator position synchronized to the control algorithm.
3. After the actuator reaches the position calculated by the thermostat, a waiting time of 30 seconds is applied to stabilize the outputs.

PWM control

The demand calculated by PI control from the current room temperature and set-point is provided via Y1 to the valve actuator as a PWM signal (Pulse width modulation) for thermic actuators. The output is switched on for a period proportional to the heat/cool demand and then switched off for the rest of the PWM interval.

The interval is 150 sec (factory setting). It can be adjusted via parameters P44 (Y1). The parameters are only visible if 2-point is selected via DIP switch 5.

PWM for thermic valve actuators

For thermic valve actuators, set the running time to 240 sec.

Note!

- Never apply PWM to a motoric actuator.
- It is not possible to ensure exact parallel running of more than one thermic valve actuator. If several fan coils are driven by the same thermostat, preference should be given to motoric actuators.

PWM for el. heaters

For electric heaters, set the running time to 90 sec.
In order to avoid burn-off of mechanical contacts by frequent switching, use a current valve instead of a relay or contactor.

4.9 Multifunctional input, Digital input

The thermostat offers two multifunctional inputs X1 and X2 and a digital input D1. A sensor of type NTC like QAH11.1 (AI, analog input) or a switch (DI, digital input) can be connected to the input terminals. The functionality of the inputs can be configured via parameters P38 for X1, P40 for X2, and P42 for D1.

#	*Function of input*	*Description*	*Type X1/X2*	*Type DI*
0	Not used	No function.	--	--
1	External/Return air temp.	Sensor input for external room temperature sensor or return air temperature sensor to measure the current room temperature, or floor heating temperature sensor to limit the heating output. *Note:* The room temperature is measured by the built-in sensor if the floor heating limitation function is enabled via parameter P51.	AI	
2	Heat/cool changeover	Sensor input for automatic heating / cooling changeover function. A switch can also be connected rather than a sensor (switch closed = cooling, see section 4.6).	AI/(DI)	DI
3	Operating mode switchover	Digital input to switch over the operating mode to Energy Saving. If the operating mode switchover contact is active, user operations are ineffective and “OFF” is displayed.	DI	DI
4	Dewpoint monitor	Digital input for a dewpoint sensor to detect condensation. Cooling is stopped if condensation occurs.	DI	DI
5	Enable electrical heater	Digital input to enable/disable the electrical heater via remote control.	DI	DI
6	Fault	Digital input to signal a fault. If the input is active, “ALx” is displayed (Alarm x, with x = 1 for X1, x = 2 for X2, x = 3 for D1). *Note*: Fault displays do not influence the thermostat's operation. They merely represent a visual signal. *Example:* dirty air filter	DI	DI

Operational action can be changed between normally open (N.O.) and normally closed (N.C.) via parameter P39, P41 (or P43 if it is a digital input).
Each input X1, X2 or D1 must be configured with a different function (1 … 5).
Exception: one or two or three inputs may be configured as alarm inputs (6)

X1 is factory-set to “External sensor” (1), X2 to “Heating/Cooling changeover” (2), and D1 to Operating mode changeover (3).

For more information see section 4.5 “Applications”.

4.10 Handling of faults

Temperature out of range

When the room temperature is outside the measuring range, i.e. above 49 °C or below 0 °C, the limiting temperatures flash, e.g. “0 °C” or “49 °C”.
The heating output is energized if the current setpoint is not set to “OFF”, the thermostat is in heating mode and the temperature is below 0 °C.
For all other cases, no output is energized.
The thermostat resumes Comfort mode after the temperature returns to within the measuring range.

4.11 DIP switches

Use the DIP switches on the rear side of the thermostat to commission the thermostat's basic application prior to snapping it to the base.

– The application is set via DIP switches 1 … 3.
– The function of the control outputs (2-position or 3-position, DC 0 … 10 V) is set via DIP switches 4 and 5.

For details concerning connection of peripheral devices and setting of the DIP switches please refer to the mounting instructions, document M3182 [3].

Note During startup, the thermostat reloads the control parameter factory settings after each change of DIP switch setting.

4.12 Control parameters

A number of control parameters can be readjusted to optimize control performance. These parameters can also be set during operation without opening the unit. In the event of a power failure, all control parameter settings are retained.

The control parameters are divided in two levels:
- “Service” level, and
- “Expert” level and "Diagnostics & test"

The “Service” level contains a small set of parameters to set up the thermostat for the HVAC system and to adjust the user interface. These parameters can usually be adjusted any time.
Change parameters in the “Expert” level only carefully, as they impact control performance and functionality of the thermostat.

Parameter setting

Change the parameters as follows:

Enter only “Service” level

1. Press left + right button simultaneously >3sec, release, then press right button >3sec
   The display shows “P01” (or P02 when P01 is not available).
   Continue with Step 2.

Enter “Expert” level and "Diagnostics & test"

1. Press left button + right button simultaneously >3sec, release, press left button >3sec, then rotate rotary knob anti-clockwise min ½ rotation
   The display shows “Pxx”.
   Continue with Step 2.

Adjust parameters

2. Select the required parameter by turning the rotary knob.
3. Press ✔ (OK); the current value of the selected parameter starts to flash and can be changed by turning the rotary knob.
4. Press ✔ (OK) to confirm the adjusted value or ⎋ (Esc) to cancel the change.
5. If you wish to adjust additional parameters, repeat steps 2 through 4
6. Press ⎋ (Esc) to leave the parameter mode.

Reset parameters

The factory setting for the control parameters can be reloaded via parameter P71, by changing the value to “ON”, and confirming by pressing the right button.
The display shows “8888” during reload.

4.12.1 Parameters Service level

Parameter	Name	Factory setting	Range		RDG400
	Service level				
P01	Control sequence	When 2-pipe / 2-stage: 1 = Cooling only When 4-pipe: 4 = H and C	0 = Heating only 1 = Cooling only 2 = H/C changeover manual 3 = H/C changeover auto 4 = Heating and Cooling		✓
P02	User operating mode profile (mode button)	1	1 = (Auto) - Comfort - Protection 2 = (Auto) - Comfort - E Saving - Prot		✓
P04	Selection of °C or °F	0 (°C)	0 = Degrees Celsius (°C) 1 = Degrees Fahrenheit (°F)		✓
P05	Sensor calibration (intern, extern)	0 K	– 3 ... 3 K		✓
P06	Standard temperature display	0	0 = Room Temperature 1 = Setpoint		✓
P07	Display info line (2nd line of LCD)	0	0 = --- (No display) 1 = °C and °F		0..1
P08	Comfort setpoint	21 °C	5 ... 40 °C		✓
P09	Minimum setpoint in Comfort mode	5 °C	5 ... 40 °C		✓
P10	Maximum setpoint in Comfort mode	35 °C	5 ... 40 °C		✓
P11	Energy Saving heating setpoint	15 °C	OFF, 5 ... WcoolE-saving; (WcoolE-saving = 40 °C max)		✓
P12	Energy Saving cooling setpoint	30 °C	OFF, WHeatE-saving ... 40 °C; (WHeatE-saving = 5 °C min)		✓
P14	Button lock function	0	0 = Unlocked 1 = Auto locked 2 = Manual locked		✓

Note Parameter display depends on selected application and function

4.12.2 Parameters Expert level, diagnostics & test

Parameter	Name	Factory setting	Range		RDG400
	Expert level				
P30	P-band / Switching differential in heating mode	2 K	0.5 … 6 K		✓
P31	P-band / Switching differential in cooling mode	1 K	0.5 … 6 K		✓
P32	P-band / Switching differential for radiator	2 K	0.5 … 6 K		✓
P33	Dead zone in Comfort mode	2 K	0.5 … 5 K		✓
P34	Setpoint differential (w_D)	2 K	0.5 … 5 K		✓
P35	Integral time	5 min	0…10 min		✓
P36	Heating / cooling changeover switching point cooling (X1/X2)	16 °C	10…25 °C		✓
P37	Heating / cooling changeover switching point heating (X1/X2)	28 °C	27…40 °C		✓
P38	Functionality of X1	1: = Ext. sensor	0 = --- (no function) 1 = Room temp ext / Return temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact [DI] 4 = Dew point sen. (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI)		✓ 0..6
P39	Operating action of X1 if digital input	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Closed		✓
P40	Functionality of X2	2 = H/C changeover	0 = --- (no function) 1 = Room temp ext / Return temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact [DI] 4 = Dew point sen. (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI)		✓ 0..6
P41	Operating action of X2 if digital input	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Closed		✓
P42	Functionality of D1	3 = Op. mode changeover	0 = --- (no function) 2 = H/C changeover (DI) 3 = Operating mode contact [DI] 4 = Dew point sen. (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI)		✓ 0..6
P43	Operating action of D1 if digital input	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Closed		✓
P44	Running time of Y1/Y2 output (only when modulating PI control)	150 s	20…300 sec		✓
P46	Output Y1/Y2 (if not parameterized as 3-pos.)	ON/OFF (1)	1 = 2-position 2 = PWM		✓
P51	Floor heating limit temperature	OFF	OFF, 10..50 °C		✓
P63	Minimum output limitation air flow signal	0%	0…P64 (%)		✓
P64	Maximum output limitation air flow signal	100%	P63…100 (%)		✓
P65	Protection heating setpoint	8 °C	OFF, 5 … W Cool Prot; (W Cool Prot = 40 °C max)		✓
P66	Protection cooling setpoint	OFF	OFF, W Heat Prot … 40; (W Heat Prot = 5 °C min.)		✓
P68	Prolong Comfort period	OFF	OFF; 15 ... 360 min		✓
P69	Temporary setpoint Comfort (see also Comfort setpoint P08)	OFF	OFF = Disabled ON = Enable		✓
P71	Reload factory settings	OFF	OFF = Disabled ON = Reload start		✓

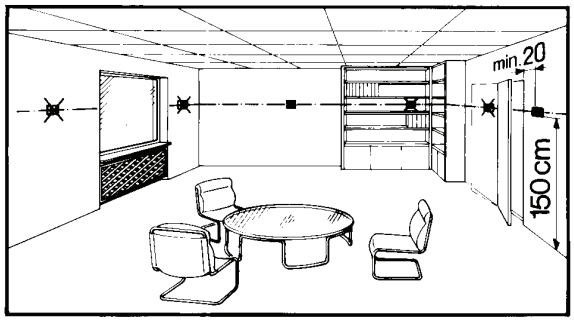
Note P46: Setting to 2-position or 3-position is done with DIP 4

Parameter	Name	Factory setting	Range		RDG400
	Diagnostics & test				
d01	Application type	Diagnostics	0:= --- (No application) 1:= Single-duct 2:= Single-duct with el. heater 3:= Single-duct with radiator 4:= Single-duct with h/c coil		✓
d02	X1 status	Diagnostics	0 = Not activated (for DI) 1 = activated (DI) 0…49 °C = cur. temp. value (for AI) 00 = HC input short 100 = HC input open		✓
d03	X2 status	Diagnostics	0 = Not activated (for DI) 1 = activated (DI) 0…49 °C = cur. temp. value (for AI) 00 = HC input short 100 = HC input open		✓
d04	D1 status	Diagnostics	0 = Not activated (for DI) 1 = activated (DI) 00 = HC input short 100 = HC input open		✓
d05	Test mode for checking the Y1/Y2 actuator direction (press left button to escape)	---	"---" = no signal on outputs Y1 and Y2 OPE = output Y1 forced open CLO = output Y2 forced closing		✓

5 Handling

5.1 Mounting and installation

Do not mount on a wall in niches or bookshelves, behind curtains, above or near heat sources, or exposed to direct solar radiation. Mount about 1.5 m above the floor.



Mounting

⚠

- The room thermostat must be mounted in a clean, dry indoor place and must not be exposed to drip or splash water

Wiring

See Mounting Instructions (M3182) enclosed with the thermostat.

⚠

- Comply with local regulations to wire, fuse and earth the thermostat
- The power supply line must have an external fuse or circuit breaker with a rated current of no more than 10 A

⚠
⚠

- Inputs X1-M, X2-M or D1-GND of different units (e.g. summer / winter switch) may be connected in parallel with an external switch. Consider overall maximum contact sensing current for switch rating
- Disconnect power supply before removing the thermostat from the mounting plate!

Commissioning

Select the application and type of control output via the DIP switches before fitting the thermostat to the mounting plate.
After power is applied, the thermostat carries out a reset during which all LCD segments flash, indicating that the reset was correct. After the reset, which takes about 3 seconds, the thermostat is ready for commissioning by qualified HVAC staff. The control parameters of the thermostat can be set to ensure optimum performance of the entire system (see Basic Documentation P3182).

Control sequence

- The control sequence may need to be set via parameter P01 depending on the application. The factory setting for the single-duct application is “Cooling only”

Calibrate sensor

- Recalibrate the temperature sensor if the room temperature displayed on the thermostat does not match the room temperature measured. To do this, change parameter P05

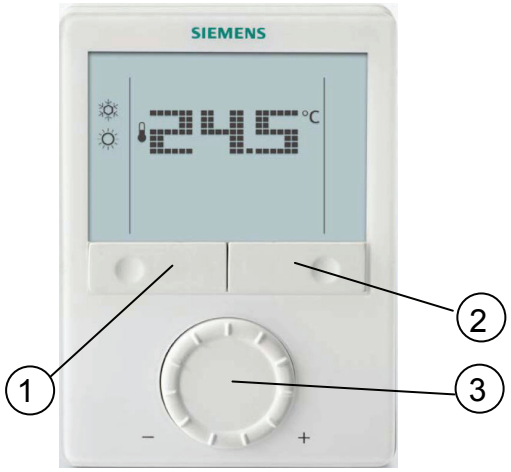
Setpoint and setpoint range limitation

- We recommend to review the setpoints and setpoint ranges (parameters P08…P12) and change them as needed to achieve maximum comfort and save energy

5.2 Operation

See also the operating instructions B3181 enclosed with the thermostat.

Layout



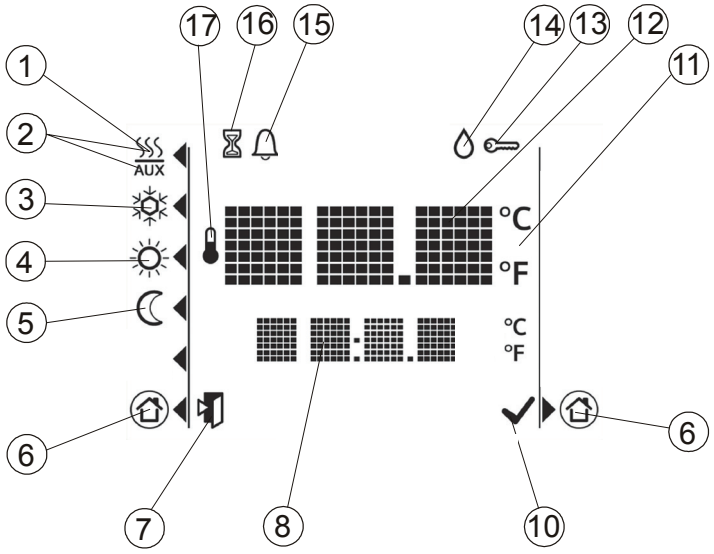
1 Operating mode button / Esc
2 Protection mode and OK
3 Rotary knob for setpoint and parameter adjustment

Button operation

- When the thermostat is in normal operation, the actual operating mode and status is indicated by symbols.
- When a button is pressed, the RDG goes into the Mode selection
  The LCD backlight will turn on, all possible mode selection options (symbols) will turn on, indicator element (arrow) will appear on the current mode/status.
- When the button is pressed again, the indicator element will toggle to the next mode symbol and so on.
- After the last press and a timeout of 3 sec, the new selected mode is confirmed, the other elements disappear.
- After a timeout of 20 sec the LCD backlight will turn off

User action	Effect, description
Press left button	Go into Operating mode selection
Press left button >3 sec	Set thermostat to Protection mode
Remain on left button and turn rotary knob clockwise	Activate temporary timer "Extend presence" and set the time (details see page 16)
Remain on left button and turn rotary knob anti-clockwise	Activate temporary timer " Extend absence" and set the time (details see page 16)
Press left button while "Operating mode switch-over" is activated	Activate " Extend Comfort mode" (details see page 16)
Press right button >3 sec	Activate/deactivate button lock
Press right button	Change to protection mode and back
Rotate rotary knob	Adjust the room temperature setpoint
Press left + right button >3sec, release, then press right button >3sec	Go into parameter mode Service level
Press left button + right button 3sec, release, press left button 3sec, then rotate rotary knob counter-clockwise min ½ rotation	Go into parameter mode Expert level, diagnostics & test

LCD display



#	Symbol	Description	#	Symbol	Description
1		Heating mode	10		Confirmation of parameters
2	AUX	Electrical heater active	11	°C °F	Degrees Celsius Degrees Fahrenheit
3		Cooling mode	12		Digits for room temperature and setpoint
4		Comfort mode	13		Button lock active
5		Energy Saving mode	14		Condensation in room (dewpoint sensor active)
6		Protection	15		Fault
7		Escape	16		Temporary timer function (visible when operating mode is temporarily extended presence or absence)
8		Digits for room temperature, setpoint, etc.	17		Indicates that room temperature is displayed

5.3 Disposal

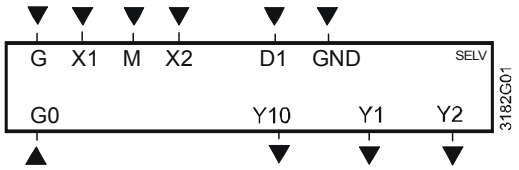
The device is classified as waste electronic equipment in terms of the European Directive 2002/96/EC (WEEE) and should not be disposed of as unsorted municipal waste.

The relevant national legal rules are to be adhered to.
Regarding disposal, use the systems setup for collecting electronic waste.

Observe all local and applicable laws.

6 Engineering

6.1 Connection terminals



G, G0 Operating voltage AC 24 V

Y10/G0 Control output for DC 0…10 V actuator

Y1/G, Y2/G Control output for 2-position, PWM or 3-position actuators

X1, X2 Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch
Factory setting:
- X1 = external room temperature sensor
- X2 = sensor or switch for automatic heating / cooling changeover

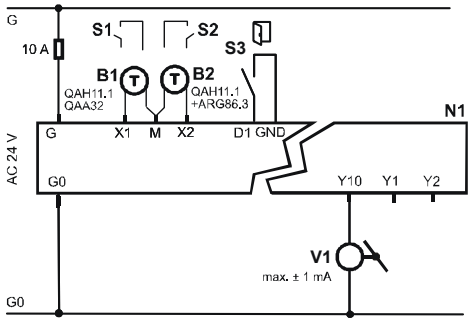
M Measuring neutral for sensor and switch

D1, GND Multifunctional input for potential-free switch.
Factory setting: Operating mode switchover contact

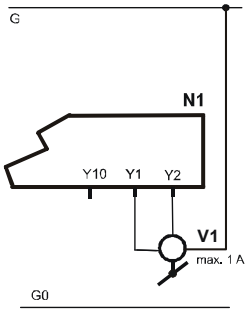
6.2 Connection diagrams

Note For details concerning connection of peripheral devices and setting of the DIP switches please refer to the mounting instructions, document M3182.

Application: Single-duct



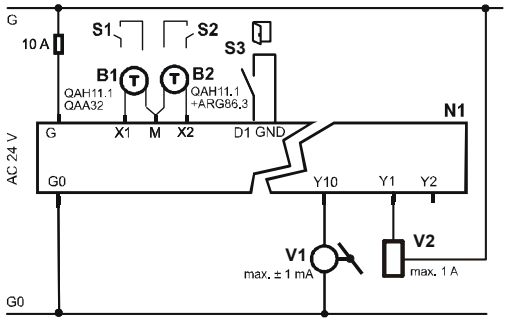
V1 DC 0…10 V damper actuator



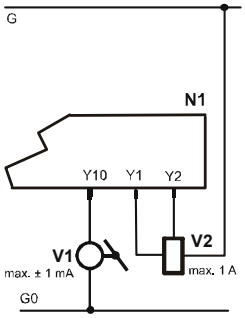
V1 3-position damper actuator

N1 Room thermostat RDG400
S1..S3 Switch (keycard, window contact, etc.)
B1, B2 Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)

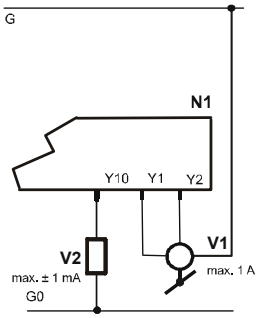
Application: Single-duct with electrical heater, radiator or heating / cooling



V1 DC 0…10 V damper actuator
V2 2-position or PWM electrical heater, radiator or heating / cooling valve



V1 DC 0…10 V damper actuator
V2 3-position electrical heater, radiator or heating / cooling valve



V1 3-position damper actuator
V2 DC 0…10 V electrical heater, radiator or heating / cooling valve

N1 Room thermostat RDG400
S1..S3 Switch (keycard, window contact, etc.)
B1, B2 Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)

7 Mechanical design

7.1 General

The room thermostat consists of 2 parts:

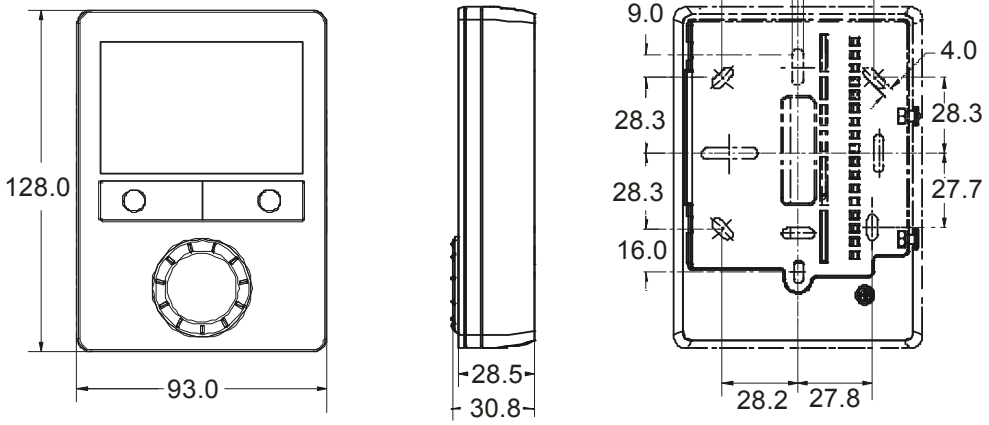
- Plastic housing which accommodates the electronics, the operating elements and the temperature sensor
- Mounting plate with the screw terminals

The housing engages in the mounting plate and is secured with 2 screws on the left side.

Operation see section 5.2.

7.2 Dimensions

Dimensions in mm



8 Technical data

⚠ Power supply	Operating voltage		SELV AC 24 V ±20%
	Frequency		50/60 Hz
	Power consumption		Max. 2 VA
Outputs	Control output Y10-G0		DC 0…10 V
	Resolution		39 mV
	Current		Max. ±1 mA
	Control output Y1, Y2-G		AC 24 V
	Rating		Max. 1 A
Inputs	Multifunctional inputs		
	X1-M / X2-M		
	Temperature sensor input		
	Type		QAH11.1 (NTC)
	Digital input		
	Operating action		Selectable (NO/NC)
	Contact sensing		DC 0…5 V, max. 5 mA
	D1-GND		
	Operating action		Selectable (NO/NC)
	Contact sensing		SELV DC 6…15 V, 3…6 mA
	Function input External temperature sensor, changeover sensor, operating mode switchover contact, dewpoint monitor contact, enable electrical heater contact, fault contact		Selectable
Operational data	Switching differential, adjustable		
	Heating mode	(P30)	2 K (0.5...6 K)
	Cooling mode	(P31)	1 K (0.5...6 K)
	Setpoint setting and range		
	☼ Comfort mode	(P08)	21 °C (5...40 °C)
	☾ Energy Saving mode	(P11-P12)	15 °C/30 °C (OFF, 5...40 °C)
	⌂ Protection	(P65-P66)	8 °C/OFF (OFF, 5...40 °C)
	Multifunctional inputs X1 / X2 / D1		Selectable
	Input X1		Ext. temperature sensor (P38=1)
	Input X2		Changeover sensor (P40=2)
	Input D1		Operating mode switchover (P42=3)
	Built-in room temperature sensor		
	Measuring range		0…49 °C
	Accuracy at 25 °C		< ± 0.5 K
	Temperature calibration range		± 3.0 K
	Settings and display resolution		
	Setpoints		0.5 °C
	Current temperature value displayed		0.5 °C

Environmental conditions	Operation	As per IEC 721-3-3
	Climatic conditions	Class 3K5
	Temperature	0...50 °C
	Humidity	<95% r.h.
	Transport	As per IEC 721-3-2
	Climatic conditions	Class 2K3
	Temperature	−25... 60 °C
	Humidity	<95% r.h.
	Mechanical conditions	Class 2M2
	Storage	As per IEC 721-3-1
	Climatic conditions	Class 1K3
	Temperature	−25... 60 °C
	Humidity	<95% r.h.
Standards	CE conformity	
	EMC directive	2004/108/EC
	N474 **C-tick** conformity to	
	EMC emission standard	AS/NSZ 4251.1:1999
	RoHS 2002/95/EC Reduction of hazardous substances	2002/95/EC
	Product standards	
	Automatic electrical controls for household and similar use	As per EN 60730–1
	Special requirements for temperature-dependent controls	As per EN 60730–2-9
	Electronic control type	2.B (micro-disconnection on operation)
	Electromagnetic compatibility	
	Emissions	As per IEC/EN 61000-6-3
	Immunity	As per IEC/EN 61000-6-2
	Safety class	III as per EN 60730
	Pollution class	Normal
	Degree of protection of housing	IP30 as per EN 60529
General	Connection terminals	Solid wires or prepared stranded wires 1 x 0.4…2.5 mm^2 or 2 x 0.4…1.5 mm^2
	Housing front color	RAL 9003 white
	Weight	0.350 kg

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